as Loew's description ("scutellum totum flavum") would indicate. When you try to make eastern species fit the description of *C. ventricosum* you have "troubles of your own." The *ventricosum* of the New Jersey list should therefore be *C. derivatum* Walk. I have seen no specimens of *ventricosum* from east of New Mexico and Colorado. It is certainly very close to the *C. arcuatum* Latr. of Europe.

Chrysotoxum pubescens Loew, Wien. Ent. Monatschr., IV, 84, 1860.

The types of this species are both from "Ill." Specimens agreeing in every respect with the types are frequently taken throughout the eastern United States from Maine to Virginia. The inverted V and Y which has been used in describing the markings on the fifth abdominal segment, is apt to lead to some confusion in separating the closely related species *C. pubescens* and *C. laterale*; the former calls for an inverted V, the latter an inverted Y. This distinction however is not as clear as it seems, as it varies in the two sexes, being usually more V shaped in the ♂ and Y shaped in the ♀. This variation has also been pointed out by Mr. C. H. Tyler Townsend (Trans. Amer. Entom. Soc., XXII, 35, 1895). The type (♂) of *C. laterale*, from "Nebr." is readily distinguished by having the third, fourth and fifth segments broadly, laterally margined with yellow. A specimen (♀) from the same state shows a very slight indication of the margin being interrupted. A similar specimen from New Jersey, I have also referred to *C. laterale*. In the twelve specimens before me there is an indication that *laterale* may possibly prove to be only an extreme variation of *pubescens*.

Chrysotoxum derivatum Walker, List III, 542, 1849.

The type of this species is from "St. Martins Fall, Albany River, Hudson Bay." We should therefore expect specimens from the same faunal area to be more typical than those from more southern localities. A specimen from Grand Lake, Newfoundland, collected by Mr. Owen Bryant agrees more closely with the description than any other; between this specimen however and a series from N. H., Mass., N. J., and Penna, it seems to be impossible to draw a line notwithstanding minor discrepancies. The Newfoundland specimen is about 9 mm. in length (Walker's description calls for 3½ lines), the basal two-thirds of all the femora are blackish and the markings on the fifth segment can be described as "three large yellow spots." All of these characters are however extremely variable; the eight specimens which I refer to this species vary from 9 to 11 mm.; the specimen selected by Loew from the English River, Can., as representing this species, has the basal half of the femora

black, while the two arcuate yellow spots on the fifth segment are narrowly connected with the central triangle. Two specimens from Mass. have only the basal third of the front and middle femora blackish, the basal half of the posterior femora being brownish; in one the brown forms a conspicuous middle band. A specimen from Franconia, N. H., collected by Mrs. A. T. Slosson has the posterior femora only slightly tinged with red towards the base; a similar specimen was collected at Folsom, Pa. Three specimens from Riverton, N. J., show only a slight basal tinge of brown on the front and middle femora.

CHRYSOTOXUM FASCIOLATUM Meigen. Syst. Beschr., III, 171, 1822.

In 1905 I received from Mr. H. H. Newcomb a large *Chrysotoxum* (♀), which he collected at Gold Rock (Rainy R. District), Ontario, July 21. While collecting on the summit of Mt. Greylock, Mass., July 15, 1906, alt. 3535 ft., I obtained after much difficulty, owing to their rapid flight and habit of poising in the air just out of reach of the net, a ♂ of the same species. Later I received from Mr. E. F. Hitchings two specimens collected at Hancock, Me., in June. That it was a species new to our fauna was readily apparent, but its determination was another matter; a new *Chrysotoxum* is not an inspiring thing, under existing conditions, and you feel like putting off the evil day.

An inspection of the Loew collection at the Museum of Comparative Zoology, through the kindness of Mr. Henshaw, revealed two specimens of this species, one marked "Mass.," the other "Can." and labeled "*fasciolatum?*". Lately I have received a specimen of this European species from Dr. F. Hermann, and find no character to separate the American specimens. Why was it not included by Loew and Osten Sacken in the Americana fauna? We can only account for it in this way, Loew was describing only the new species. Osten Sacken may have overlooked it, or perhaps seeing the name questioned, thought it best to have its capture verified.

It is a conspicuous species measuring from 13–15 mm. in length, and readily distinguished by the wide black band extending entirely across the scutellum, leaving only a narrow basal and apical margin of yellow. None of the interrupted abdominal bands extend to the lateral margin, although in one specimen and in the one from Europe it is narrowly connected with the yellow at the posterior angle; the marking on the fifth segments might be described as a broad inverted Y. Basal half of the front and middle femora black, of the posterior femora brown.

Mixogaster breviventris Kahl.

M. breviventris Kahl, Kansas Univ. Quart., VI, p. 137, 1897.

A male and female of this interesting species were collected by Mr. Erich Daecke, at Lucaston, N. J., August 27, 1905. The type, a female, was described from Lawrence, Kans. The male differs but little from the female except that the fourth segment is nearly twice the length of the third, the posterior border on both being greatly dilated towards the lateral margins; the fifth segment and hypopygium (in the specimen before me) seem to be injured or forced within the abdomen, so that they cannot be accurately described.

TRICHOGRAMMA PRETIOSA RILEY: SEASONAL HISTORY.

by A. A. Girault, Washington, D. C.

The paper here presented for publication is one of a series on this insect based on observations and studies made during the Cotton Bollworm Investigations in Texas in 1904, by the U. S. Department of Agriculture. The observations were made in the laboratory at Paris, latitude 33°, 45′ north and the host of the parasite was *Heliothis obsoleta* Fabricius, unless otherwise stated in the text. In their report on the bollworm, Quaintance and Brues (1905) have already given the substance of much that is to follow, but I believe the observations of enough importance to justify elaboration, an impossibility in connection with an economic report of that kind.

Number of Generations.

The species under consideration is a remarkable example of an hymenopterous insect having multiple generations, and to this fact may be largely attributed its efficiency as a parasite. From the beginning to the end of the breeding season of 1904, it was under constant observation, and in the laboratory many successive generations were bred, so that actual records were obtained for fifteen consecutive cycles from the latter part of May to the first week in November. In addition to this direct evidence, there was also obtained much supplementary data, which warrants a positive statement to the effect that there were at least eighteen distinct generations of the little egg-parasite in the vicinity of Paris in 1904. The records show that the parasites began to appear about May 3rd, corresponding to the first noticeable

appearance of the host eggs on corn, and they were present throughout the season in increasing numbers until about November 20th. To obviate further unnecessary discussion and for the sake of clearness and convenience, the generations are tabulated as follows:

Table I. Generations at Paris, Texas, 1907.

Generation No.	Eggs deposited.	Adults out.	Approximate length of cycle.	Sums of effective temperature.
1.	May 3	May 16	13 days.	321.1° *Fahr.*
2.	May 16	May 26	10 "	313.2
3.	May 26	June 6	11 "	354.7
4.	June 4	June 14	10 "	318.4
5.	June 14	June 22	8 "	297.2
6.	June 22	July 1	9 "	330.9
7.	July 1	July 9	8 "	298.9
8.	July 11	July 20	9 "	365.7
9.	July 20	July 28	8 "	300.
10.	July 29	August 6	8 "	298.7
11.	August 6	August 14	8 "	298.1
12.	August 14	August 23	9 "	364.0
13.	August 25	September 2	8 "	308.4
14.	September 2	September 11	9 "	308.
15.	September 11	September 20	9 "	314.2
16.	September 21	September 30	9 "	323.1
17.	October 1	October 14	13 "	408.1
18.	October 14	November 2	19 "	365.0
18a.	October 14	November 7	21 "	449.
18b.	October 14	November 8	25 "	465.
18c.	October 14	November 10	27 "	480.
Sums			254 days.	7285.0
Averages			12 days.	346.6° Fahr.

Length of Life Cycle.

By consulting table I, it is seen that the developmental period of a generation

varied considerably, from about 8 to 27 days, according to the season. Upon the approach of warm weather, it gradually decreased and remained practically constant from about the middle of June to about the middle of September, or during the warm summer months. In the fall, it rapidly increased in length, becoming twice as long in November as it was for the first generation in May, as would be expected from the fact that the mean daily effective temperature at that time of the year was very low. Table II is introduced to show as accurately as possible the lengths of the life cycles at different dates in 1904.

Table II. Lengths of the Life Cycle, Paris, Texas, 1904.

Lot No.	Dates.	Eggs deposited.	Adults out.	Approximate length of cycle.	
				Days.	Hours.
1.	May 3–May 16	May 3	May 16	13	
2.	May 26–June 6	P. M. May 26	Noon, June 6	10	21
3.	May 27–June 7	P. M. May 27	A. M. June 7	10	17
4.	June 1–June 12	A. M. June 1	A. M., June 12	10	17
5.	June 4–June 14	P. M., June 4	Noon, June 14	9	20
6.	June 14–June 22	A. M., June 14	A. M., June 22	7	22
7.	June 14–June 22	A. M., June 14	A. M., June 22	7	15
8.	June 20–June 28	A. M., June 20	P. M., June 28	8	6
9.	June 22–June 30	Noon, June 22	Noon, June 30	8	0
10.	June 22–July 1	P. M., June 22	A. M., July 1	8	14
11.	July 1–July 9	A. M., July 1	A. M., July 9	8	0
12.	July 20–July 28	P. M., July 20	A. M., July 28	7	19
13.	July 29–August 6	Noon, July 29	A. M., August 6	7	20
14.	Sept. 12–Sept. 20	P. M., Sept. 12	P. M., Sept. 20	8	0
15.	Sept. 21–Sept. 30	A. M., Sept. 21	A. M., Sept. 30	8	23
16.	Sept. 26–Oct. 4	A. M., Sept. 26	A. M., Oct. 4	8	6
17.	Sept. 28–Oct. 6	A. M., Sept. 28	P. M., Oct. 6	8	9
18.	Oct. 1–Oct. 14	Noon, Oct. 1	Noon, Oct. 14	13	0
19.	Oct. 14–Nov. 2	A. M., Oct. 14	A. M., Nov. 2	19	3
20.	Oct. 14–Nov. 7	A. M., Oct. 14	P. M., Nov. 7	24	6
21.	Oct. 14–Nov. 8	Oct. 14	Nov. 8	25	0
22.	Oct. 14–Nov. 10	P. M., Oct. 14	P. M., Nov. 10	27	0

The length of the life cycle was first recorded by Hubbard (Howard, 1892) in 1885 as being 7 days, the host being *Alabama argillacea* Hübner.

Hibernation.

Very little is known in regard to the mode of hibernation of many of the smaller parasitic hymenoptera, especially the more minute egg-parasites, and for this reason the following account will be of interest.

About two years before these observations were made, the method of hibernation of this species of Trichogramma was stated by W. A. Boucher whose account has not been accessible. However, Froggatt (1906) quotes Mr. Boucher as follows: "....As the parasite remains dormant in the egg of the Codling Moth[1] during the winter and spring months, it is evident that the number of parasites that will again be present at the commencement of each fruit season to continue the destruction of the Codling Moth's eggs will depend upon the number of parasitized eggs that remain uninjured during the winter, the proportion of which, under ordinary circumstances, and without artificial assistance, will be very small;...."

Mr. Boucher apparently gives no evidence to show upon what his assertion is based and hence it needs confirmation. The following data obtained in the latter part of 1904 seems to indicate that his view is correct.

As shown in table II, the length of the life cycle increased rapidly in the fall from 8 days in late September to from 13 to 19 days in October, up to 27 days by the second week in November. In fact, the last or eighteenth generation varied unusually from 19 to 27 days, and the records show that this generation was a small or scattering one, the last principal generation being the seventeenth (adult about October 14). After about this date it is believed that hibernation commenced, though adults continued to be present, in rapidly decreasing numbers, for a month later (to November 19). In about the middle of October, and later, parasitized hosts in the field (including also *Alabama argillacea* Hübner) on corn and cotton were tagged and watched for emergence of the adults. Many of these were on dried and withered leaves when tagged, and when last examined after heavy killing frosts on November 20th, were found on these shriveled leaves, which were either hanging to the plants or were on the ground. Some of the parasitized hosts, however, had been washed from the leaves to the ground by the rain. The results are shown in the attached tables.

[1] *Carpocapsa pomonella* Linnaeus.

Table III. Hibernation Statistics, Oct. 11–20, 1904.

Host Lot No.	No. hosts.	Location.	Date tagged and known parasitized.	Hosts excluding parasites and date.	Hosts not excluding parasites by Nov. 20.	Total hibernating.	Condition when last examined (Nov. 20.)
1	2	Cotton leaves	October 11	2 — Oct. 19	0	0	
2	5	Dead corn leaves	12	0	5	5	Healthy.
3	3	Dead corn leaves	14	1 — Oct. 18	2	2	Healthy.
4	3	Cotton leaves	14	3 — Oct. 21	0	0	
5	4	Corn leaves	14	3 — Nov. 2–6	1	1	"
6	11	Corn leaves	14	11 — Nov. 2–15	0	0	
7	5	Corn leaves	14	5 — Nov. 7–10	0	0	
8	9	Corn leaves	17	8 — Oct. 20–Nov. 4	1	1	"
9	4	Young corn [1]	17	2 — Nov. 6	2	2	On ground; healthy.
10	3	Young corn [1]	19	0	3	3	On ground.
11	4	Corn	19	3 — Oct. 23–Nov. 4	1	1	Healthy.
Totals	53			38 — Oct. 18–Nov. 15	15	15 [2]	Foliage wilted and dead.

[1] Planted for experimental purposes. [2] 28.3 per cent.

Table IV. Hibernation Statistics, Oct. 21–Nov. 3, 1904.

Host Lot No.	No. hosts.	Location.	Date tagged and known parasitized.	Hosts excluding parasites and date.	Hosts not excluding parasites by Nov. 20.	Total hibernating.	Condition when last examined (Nov. 20).
1	6	Cotton leaves	October 21	1 — Oct. 23	5	5	Healthy
2	8	"	22	1 — Nov. 15	7	7	6 healthy; 1 washed off.
3	12	"	22	10 — Oct. 29, Nov. 14	2	2	Healthy.
4	12	"	22	4 — Nov. 4–7	8	8	"
5	14	"	24	0	14	14	11 healthy; 3 washed off
6	14	Young corn [1]	24	1 — Nov. 6	13	13	Healthy; 7 on ground.
7	1	"	24	0	1	1	On ground
8	1	Cotton leaves	24	0	1	1	Healthy.
9	3	"	25	0	3	3	"
10	6	"	28	0	6	6	"
11	10	"	Nov. 1	2 — Nov. 16	8	8	"
12	1	"	3	0	1	1	"
Totals	88			19 — Oct. 23–Nov. 16	69	69 [2]	

[1] Planted for experimental purposes. [2] 78.4 per cent.

Summary of Tables III and IV.